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(54) **INK-JET PRINT CARTRIDGE HAVING A LOW PROFILE**

TINTENSTRAHLDRUCKPATRONE MIT EINEM NIEDRIGEN PROFIL

CARTOUCHE D'IMPRESSION A JET D'ENCRE A PROFIL REDUIT

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Description

FIELD OF INVENTION

[0001] The present invention generally relates to ink-jet print cartridges and, more particularly, to their construction.

RELATED APPLICATIONS

[0002] This application is related to the following co-pending utility patent applications, each filed concurrently on January 5, 2000:

Serial No.: 09/477,644, by Junji Yamamoto et al., entitled "Horizontally Loadable Carriage For An Ink-Jet Printer" (Publication number US6499826B1);
Serial No.: 09/477,645, by Ram Santhanam et al., entitled "Vent For An Ink-Jet Print Cartridge" (Publication number: US2002196317A1);
Serial No.: 09/477,646, by Ram Santhanam et al., entitled "Ink-Jet Print Cartridge Having A Low Profile," (Publication number US6227663B1);
Serial No.: 09/477,648 by Matt Shepherd et al., entitled "New Method of Propelling An Inkjet Printer Carriage" (Publication number : US2002168207A1);
Serial No.: 09/477,649, by Junji Yamamoto et al., entitled "Method And Apparatus For Horizontally Loading And Unloading An Ink-Jet Print Cartridge From A Carriage" (Publication number : US 6296345B1);
Serial No.: 09/477,843, by Ram Santhanam et al., entitled "Techniques For Adapting A Small Form Factor Ink-Jet Cartridge For Use In A Carriage Sized For A Large Form Factor Cartridge" (Publication number: US6161920A1.)
Serial No.: 09/477,860, by Keng Leong Ng, entitled "Low Height Inkjet Service Station" (Publication number: US2002003553A1);
Serial No.: 09/477,940, by Ram Santhanam et al., entitled "Multiple Bit Matrix Configuration For Key-Latched Printheads" (Publication number : US2002041314A1),
Serial No.: 09/478,148, by Richard A. Becker et al., entitled "Techniques For Providing Ink-Jet Cartridges With A Universal Body Structure" (Publication number: US6290348B1).
Serial No.: 09/478,190, by James M. Osmus, entitled "Printer With A Two Roller, Two Motor Paper Delivery System", (Publication number: US6293718B1) and
Serial No.: 29/116,564, by Ram Santhanam et al., entitled "Ink Jet Print Cartridge" (Publication number: US2002003553A1).

BACKGROUND OF THE INVENTION

[0003] The general construction and operation of an ink-jet print cartridge using reticulated polyurethane foam is disclosed in US Patent 4,771,295 entitled "Thermal Ink Jet Pen Body Construction Having Improved Ink Storage and Feed.Capacity" by Baker et al. issued 13 September 1988.

[0004] Prior print cartridges have been designed to be loaded into and removed from ink-jet printers either vertically or with an inclined arcuate motion. Such a procedure has proven to be satisfactory as long as vertical access to the printer is provided. This has meant, however, that nothing could be permanently stacked on top of the printer.

[0005] Further, previous top loading ink-jet printer designs have fostered an increasing growth in printer height so that with each new printer design the profile of the product grew and grew.

[0006] In this regard, attention to the printer shown in European Patent application publication EP 313205 A2, will show a printer carriage and inkjet print cartridge in which the cartridge is inserted into the carriage first downwardly and is then tipped rearwardly to latch the cartridge into the printer carriage. A printer using such a carriage and cartridge combination cannot have a low profile, and access to the printer from above is mandated.

[0007] Finally, there is a constant need to reduce the cost and the development time for new printer products. This has caused product designers to leverage existing designs and use parts from current products when developing new products for the market place. This desire to reduce start-up costs also has led product designers to utilize existing tooling and manufacturing lines as well.

[0008] Thus, it is apparent from the foregoing that, although there are many satisfactory ink-jet print cartridge designs, there is a need for an approach that permits the front loading of print cartridges into printers, reduces the profile of the cartridge itself, uses parts from products currently in production, and utilizes existing manufacturing lines.

[0009] EP-A-0313205 describes a printhead cartridge and carriage assembly comprising a carriage and a snap-spring for securing a printing cartridge in position on the carriage.

SUMMARY OF THE INVENTION

[0010] In accordance with the present invention there is provided an ink-jet print cartridge as defined in claim 1.

[0011] Other aspects and advantages of the invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a perspective view, of an ink-jet print cartridge embodying the principles of the invention.

Fig. 2 is a right side elevational view of the print cartridge of Fig. 1.

Fig. 3 is a back side elevational view of the print cartridge of Fig. 1.

Fig. 4 is a front side elevational view of the print cartridge of Fig. 1.

Fig. 5 is a left side elevational view of the print cartridge of Fig. 1.

Fig. 6 is a bottom plan view of the print cartridge of Fig. 1.

Fig. 7 is a top plan view of the print cartridge of Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] As shown in the drawings for the purposes of illustration, the invention is embodied in an ink-jet print cartridge having a low profile for front loading into a printer. The print cartridge also includes gripping surfaces and physical features that suggest to the user how to insert and remove the cartridge from a printer.

[0014] The print cartridge offers a simple solution and easy operation, incorporates many currently manufactured components, and is produced on existing manufacturing lines with minimal start-up tooling costs.

[0015] Referring to Figs. 1- 7, reference numeral 11 generally indicates an ink-jet print cartridge for a printer. The print cartridge includes a print cartridge body 12 that is generally rectangular in shape with a front wall 24, a left side wall 25, a right side wall 26, and a back wall 27. The print cartridge body houses three ink chambers for holding inks of the various hues, cyan, magenta, and yellow. The ink chambers are filled with reticulated polyurethane foam. The foam is compressed to maintain the back pressure of the ink at the print head 15, Fig. 6. In the bottom of each chamber is a stand pipe and filter of conventional construction to insure that particles do not clog the nozzles.

[0016] The print cartridge body 12 also includes a nose piece 14 that is ultrasonically welded to the body. The nose piece contains three channels that each connect to a stand pipe in one of the ink chambers. The channels direct the ink from the chambers to one of three series of nozzles 16, Fig. 6, on the print head 15. Located on the nose piece 14, Figs. 2 and 5, are an X axis datum 18 and an Z axis datum 20. These datums are holding points. The Y axis datum 19, Fig. 1, is the front wall 24 of the print cartridge and is a stop point. These datums mate with corresponding features on the carriage of the printer and locate the print cartridge in the printer during operation.

[0017] Referring to Figs. 1, 2, and 5, reference numeral 22 generally indicates two ribs that serve as gripping surfaces when the print cartridge 11 is removed from the printer. Each rib is located vertically on one of the side walls 25, 26, along the common margins between the side walls 25 and 26 and the back wall 27 of the print cartridge body 12.

[0018] Referring to Figs. 1, 2, 3, 4, and 5, reference numeral 29 generally indicates an elongate supporting lip located on the two side walls 25, 26 and the back wall 27 of the print cartridge body 12. The lip is located along the margin between the print cartridge body 12 and the lid 31, described in detail below. The portions of the lip 29 located on the side walls 25, 26, Figs. 3 and 4, support and guide the print cartridge during loading and unloading from a printer. These portions of the lip engage a pair of corresponding guide rails or loading ramps on the carriage of the printer. Also located on the print cartridge body 12, Figs. 1 and 4, is a flex circuit 33 of conventional construction. The flex circuit provides the electrical interconnection between the printer and the print head 15, Fig. 6, and routes electrical energy to the appropriate firing resistors during printing.

[0019] Referring to Figs. 1 and 7, reference numeral 35 indicates a plurality of gripping groves located along the margin between the lid 31, described in detail below, and the side walls 25, 26 of the print cartridge body 12. The gripping groves serve as a gripping surface on the print cartridge 11 from removing the print cartridge from a printer once the print cartridge has been released from the carriage. The gripping groves also serve as a visual indication with respect to any adjacent print cartridges that the associated print cartridge has been released from the carriage.

[0020] Referring to Figs. 1, 2, 3, 4, and 5, reference numeral 31 generally indicates a lid having a planer outside surface. The plane of the outside surface of the lid is also parallel to the supporting lip 29. The lid 31 is ultrasonically welded to the print cartridge body 12 along the margin of the side walls 25 and 26, the front wall 24, and the back wall 27. The lid seals the ink in the ink reservoir chambers within the print cartridge body 12. The lid also contains three vents 40, Figs. 1 and 7 that allow air at atmospheric pressure to enter each of the reservoir chambers.

[0021] Located on the lid 31, Figs. 1 and 7, proximate to the margin between the back wall 27 and the lid is a button-like structure 42. In the top plan view of the print cartridge 11, Fig. 7, this structure has an elliptical shape. In the back side elevational view, Fig. 3 , this structure has an outward opening, circular shape. In the side elevational views, Figs. 2 and 5, this structure has the shape of a chord of a circle. The middle of this structure is flush with the outside surface of the lid 31 and contains a plurality of groves 44. The groves act as a gripping surface for the user. This structure has this unique shape to indicate to the user where to push the print cartridge down to eject the cartridge from the carriage of a printer. Such downward motion releases the print cartridge from the

latch spring on the carriage.

[0022] Referring to Figs. 1 and 7, reference numeral 48 generally indicates an island located on the top surface of the lid 31 and displaced away from the margin between the lid 31 and the front wall 24 of the print cartridge body 12. The island 48 includes a latch 50 for securing the print cartridge 11 within a printer carriage. Referring to Figs. 1, 2, and 5, the latch 50 is located on the lid 31 and not on the front wall 24 so that the print cartridge can be manufactured with existing equipment and without requiring new tooling. As illustrated in Figs. 1, 2, and 5, the latch has a triangular cross section formed by a latch ramp 51 and a latch wall 52. The latch ramp 51 has three functions: to gradually increase the installing or latching force that must be exerted by the user when installing the print cartridge 11 in a printer; to case the opening of the latch spring during installation; and to continuously force the print cartridge 11 out of the printer until the print cartridge is precisely seated in the carriage. This latter feature prevents "false latching" of the print cartridge. The latch wall 52 is located perpendicular to the outside surface of the lid 31 and is the surface engaged by the latch spring when the print cartridge is precisely seated in the carriage of the printer.

[0023] The island 48, Fig. 7, further includes a latch well 54 located behind the latch wall 52. The latch well is a relieved area in the lid 31 that permits the latch spring to travel below the outside surface of the lid as necessary to maintain a constant latching force during the life of the printer. The island 48 also has two sets of keys 56 located on either side of the latch 50 that identify the print cartridge 11 to the printer.

[0024] While the print cartridge described above contains three ink reservoirs and three vents 40, Figs. 1 and 7, it is contemplated that one or more reservoirs with one or more vents can also be used. In the printer that is planned for this print cartridge, one print cartridge having one reservoir containing only black ink will be installed adjacent to a second print cartridge having three reservoirs containing the three primary hues.

[0025] Further, it is contemplated that a print cartridge can be used that does not require a lid 31 as described above. Such a cartridge would need only a top wall with the appropriate vent(s) that seals the one or more reservoirs.

[0026] Although specific embodiments of the invention have been described and illustrated, the invention is not to be limited to the specific forms or arrangement of parts so described and illustrated. The invention is limited only by the claims.

Claims

1. An ink-jet print cartridge (11) which is elongate in a horizontal direction, and which, in use, is loaded into a printer carriage by horizontal relative motion, said ink-jet print cartridge (11), comprising:

   a) a rectangular prismatic print cartridge body (12);

   b) said print cartridge body (12) having a lower wall carrying a substantially planar print head (15) with an array of vertically extending fine-dimension orifices (16) from which issues droplets of ink substantially vertically downwardly during operation of said ink-jet cartridge (11), said ink-jet cartridge (11) having a top wall (31) opposite to and generally parallel with said lower wall and a generally vertical front wall (24) intersecting with said top wall (31) to define a margin for said top wall (31);

   c) a latch (50) securely affixed to said top wall (31) of said print cartridge body (12) along said margin; and said latch (50) being located on said top wall (31) and positioned away from the margin of the top wall (31) toward a center of said top wall (31).

2. A print cartridge (11) as claimed in claim 1, wherein the top wall (31) has a planar outside surface, and said latch (50) further including a latch ramp (51) leading to a latch wall (52) located perpendicular to said outside surface of said top wall (31).

3. A print cartridge (11) as claimed in claim 1 or claim 2, further including a pair of horizontally spaced apart and generally vertically extending side walls (25, 26) intersecting with said top wall (31) to define respective side margins for said top wall (31), each of said pair of side walls (25, 26) defining one of a pair of oppositely outwardly extending supporting lips (29) located along said side margins of said top wall (31).

4. A print cartridge (11) as claimed in any preceding claim, further comprising:

   d) a gripping surface located away from said latch and including a plurality of groves (35) located along said margin between said top wall (31) and said body (12).

5. A print cartridge as claimed in any preceding claim, wherein said top wall (31) has a planar outside surface and said gripping surface includes a plurality of grooves (44) located on said planar outside surface of said top wall (31).

Patentansprüche

1. Eine Tintenstrahldruckkassette (11), die in eine horizontale Richtung länglich ist und die in Gebrauch durch eine horizontale Relativbewegung in einen Druckerwagen geladen ist, wobei die Tintenstrahldruckkassette (11) folgende Merkmale aufweist:

a) einen rechteckigen, prismatischen Druckkassettenkörper (12);
b) wobei der Druckkassettenkörper (12) eine untere Wand aufweist, die einen im Wesentlichen planaren Druckkopf (15) mit einem Array von sich vertikal erstreckenden Öffnungen (16) mit feiner Abmessung trägt, aus denen während eines Betriebs der Tintenstrahlkassette (11) Tintentröpfchen im Wesentlichen vertikal nach unten ausgegeben werden, wobei die Tintenstrahlkassette (11) eine obere Wand (31) gegenüber und allgemein parallel zu der unteren Wand und eine allgemein vertikale vordere Wand (24) aufweist, die sich mit der oberen Wand (31) schneidet, um einen Rand für die obere Wand (31) zu definieren;
c) eine Verriegelung (50), die sicher an der oberen Wand (31) des Druckkassettenkörpers (12) entlang dem Rand angebracht ist; und wobei die Verriegelung (50) an der oberen Wand (31) gelegen und von dem Rand der oberen Wand (31) weg zu einem Zentrum der oberen Wand (31) hin positioniert ist.

2. Eine Druckkassette (11) gemäß Anspruch 1, bei der die obere Wand (31) eine planare äußere Oberfläche aufweist und die Verriegelung (50) ferner eine Verriegelungsrampe (51) umfasst, die zu einer Verriegelungswand (52) führt, die senkrecht zu der äußeren Oberfläche der oberen Wand (31) gelegen ist.

3. Eine Druckkassette (11) gemäß Anspruch 1 oder Anspruch 2, die ferner ein Paar von horizontal voneinander beabstandeten und allgemein sich vertikal erstreckenden Seitenwänden (25, 26) umfasst, die sich mit der oberen Wand (31) schneiden, um jeweilige seitliche Ränder für die obere Wand (31) zu definieren, wobei jede des Paars von Seitenwänden (25, 26) eine von einem Paar von sich entgegengesetzt nach außen erstreckenden Tragelippen (29) definiert, die entlang der seitlichen Ränder der oberen Wand (31) gelegen sind.

4. Eine Druckkassette (11) gemäß einem der vorhergehenden Ansprüche, die ferner folgendes Merkmal aufweist:

d) eine Greifoberfläche, die weg von der Verriegelung gelegen ist und eine Mehrzahl von Rillen (35) umfasst, die entlang dem Rand zwischen der oberen Wand (31) und dem Körper (12) gelegen sind.

5. Eine Druckkassette gemäß einem der vorhergehenden Ansprüche, bei der die obere Wand (31) eine planare äußere Oberfläche aufweist und die Greifoberfläche eine Mehrzahl von Rillen (44) umfasst, die an der planaren äußeren Oberfläche der oberen Wand (31) gelegen sind.

Revendications

1. Cartouche d'impression à jet d'encre (11) qui est allongée dans une direction horizontale et qui, en utilisation, est chargée dans un chariot d'imprimante par un mouvement relatif horizontal, ladite cartouche d'impression à jet d'encre (11), comprenant :

a) un corps de cartouche d'impression prismatique rectangulaire (12) ;
b) ledit corps de cartouche d'impression (12) comportant une paroi inférieure portant une tête d'impression sensiblement plane (15) avec une matrice d'orifices de petite dimension s'étendant verticalement (16) à partir desquels des gouttes d'encre sortent sensiblement verticalement vers le bas pendant le fonctionnement de ladite cartouche à jet d'encre (11), ladite cartouche à jet d'encre (11) ayant une paroi supérieure (31) opposée à et globalement parallèle à ladite paroi inférieure et une paroi frontale globalement verticale (24) coupant ladite paroi supérieure (31) de manière à définir une marge pour ladite paroi supérieure (31);
c) un verrou (50) solidement fixé à ladite paroi supérieure (31) dudit corps de cartouche d'impression (12) le long de ladite marge ; et ledit verrou (50) étant disposé sur ladite paroi supérieure (31) et positionné loin de la marge de la paroi supérieure (31) vers le centre de ladite paroi supérieure (31).

2. Cartouche d'impression (11) selon la revendication 1, dans laquelle la paroi supérieure (31) possède une surface extérieure plane et ledit verrou (50) comporte en outre, une rampe de verrou (51) conduisant à une paroi de verrou (52) disposée perpendiculairement à ladite surface extérieure de ladite paroi supérieure (31).

3. Cartouche d'impression (11) selon la revendication 1 ou la revendication 2, comportant en outre une paire de parois latérales espacées horizontalement et s'étendant globalement verticalement (25, 26) coupant ladite paroi supérieure (31) de manière à définir des marges latérales respectives pour ladite paroi supérieure (31), chaque paroi de ladite paire de parois latérales (25, 26) définissant une lèvre parmi une paire de lèvres support s'étendant de manière opposée vers l'extérieur (29) disposées le long des dites marges latérales de ladite paroi supérieure (31).

4. Cartouche d'impression (11) selon l'une quelconque des revendications précédentes, comprenant en

outre :

d) une surface de prise disposée loin dudit verrou et comportant une pluralité de gorges (35) disposées le long de ladite marge entre ladite paroi supérieure (31) et ledit corps (12).

5. Cartouche d'impression selon l'une quelconque des revendications précédentes, dans laquelle ladite paroi supérieure (31) possède une surface extérieure plane et ladite surface de prise comporte une pluralité de gorges (44) disposées sur ladite surface extérieure plane de ladite paroi supérieure (31).

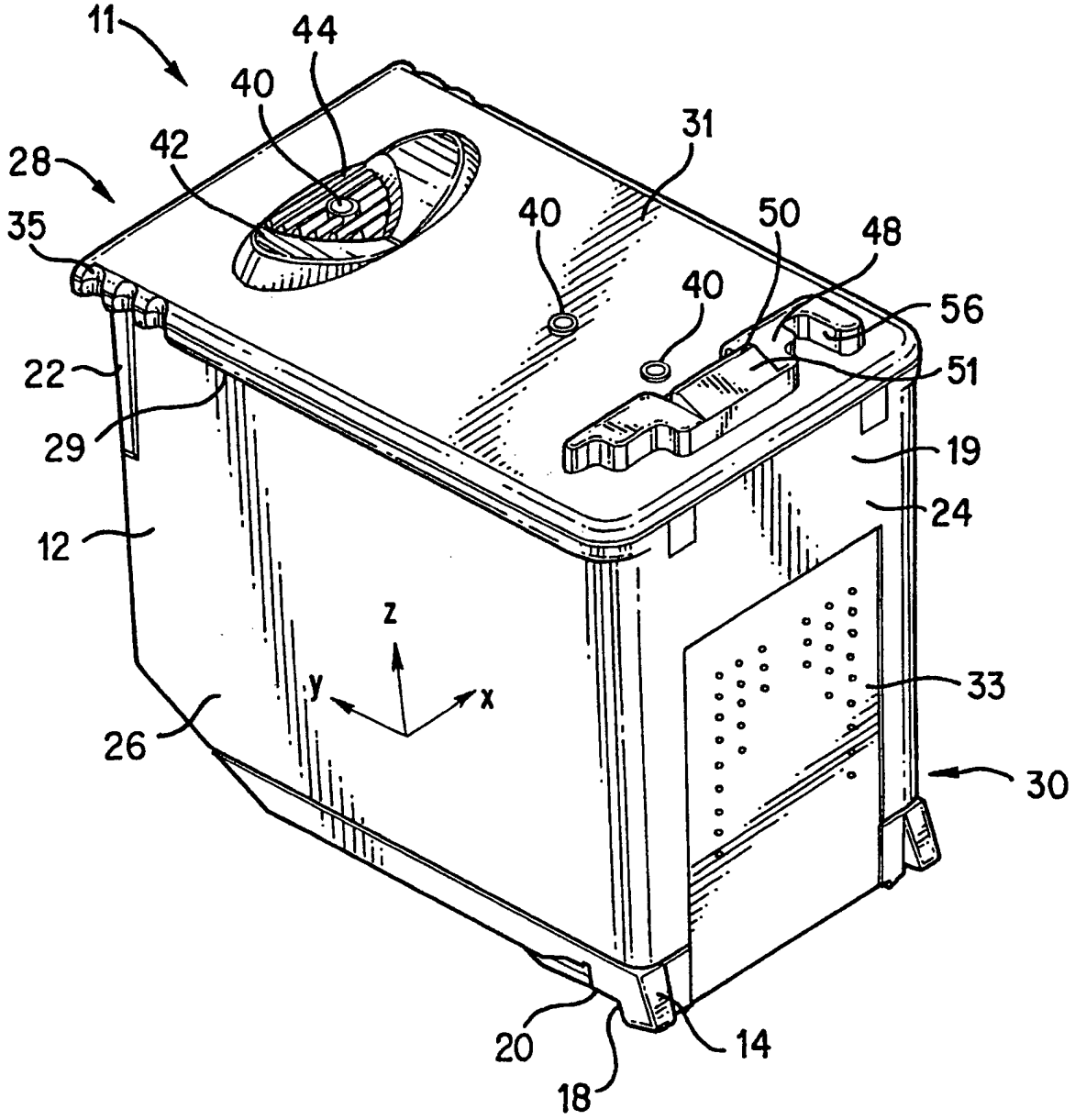
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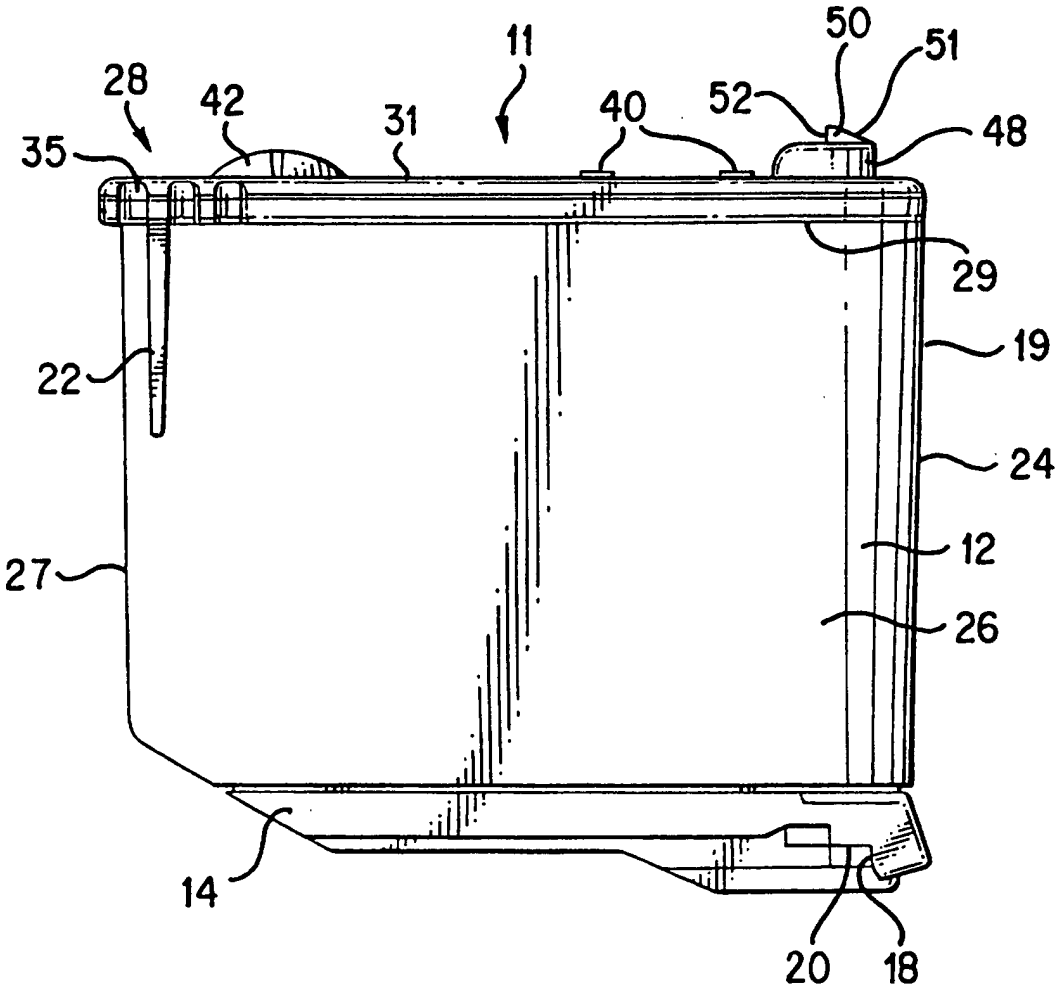
FIG. 1



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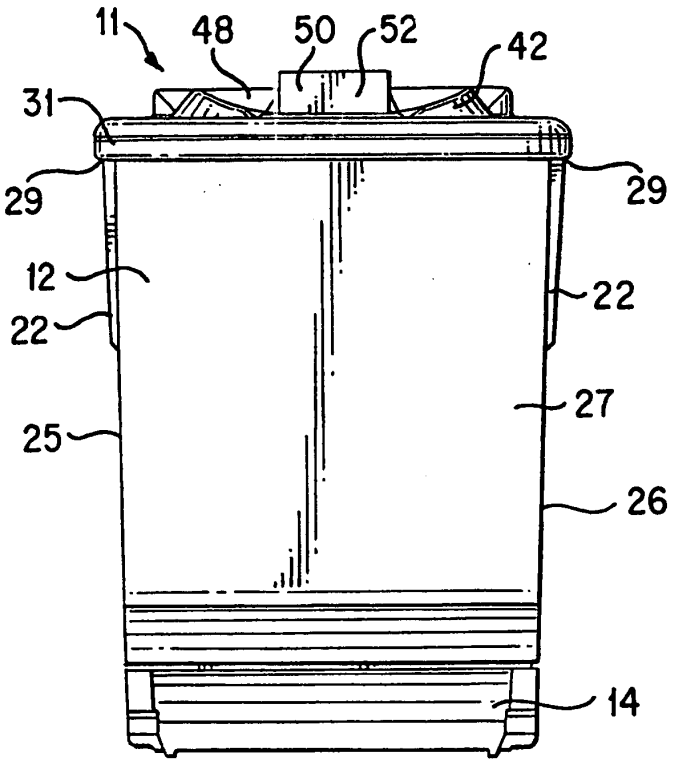
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FIG. 3

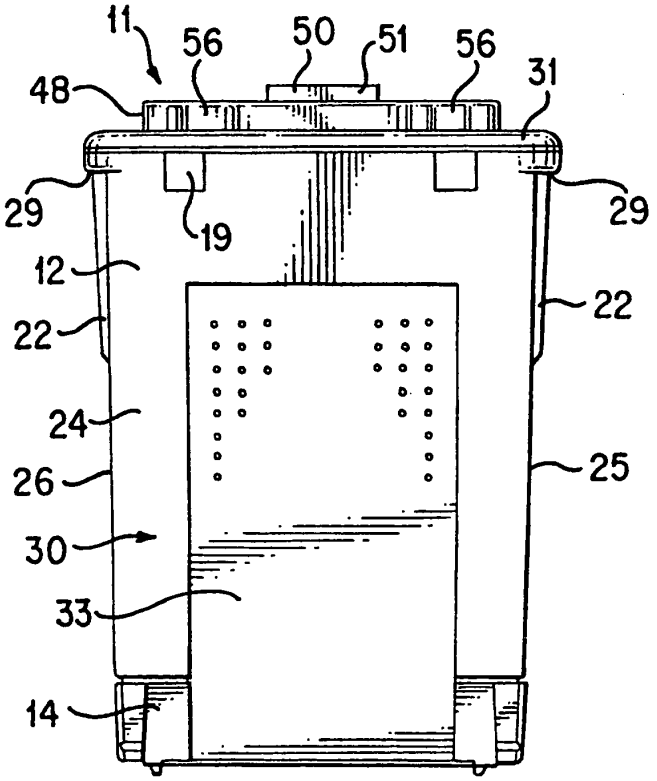
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FIG. 4

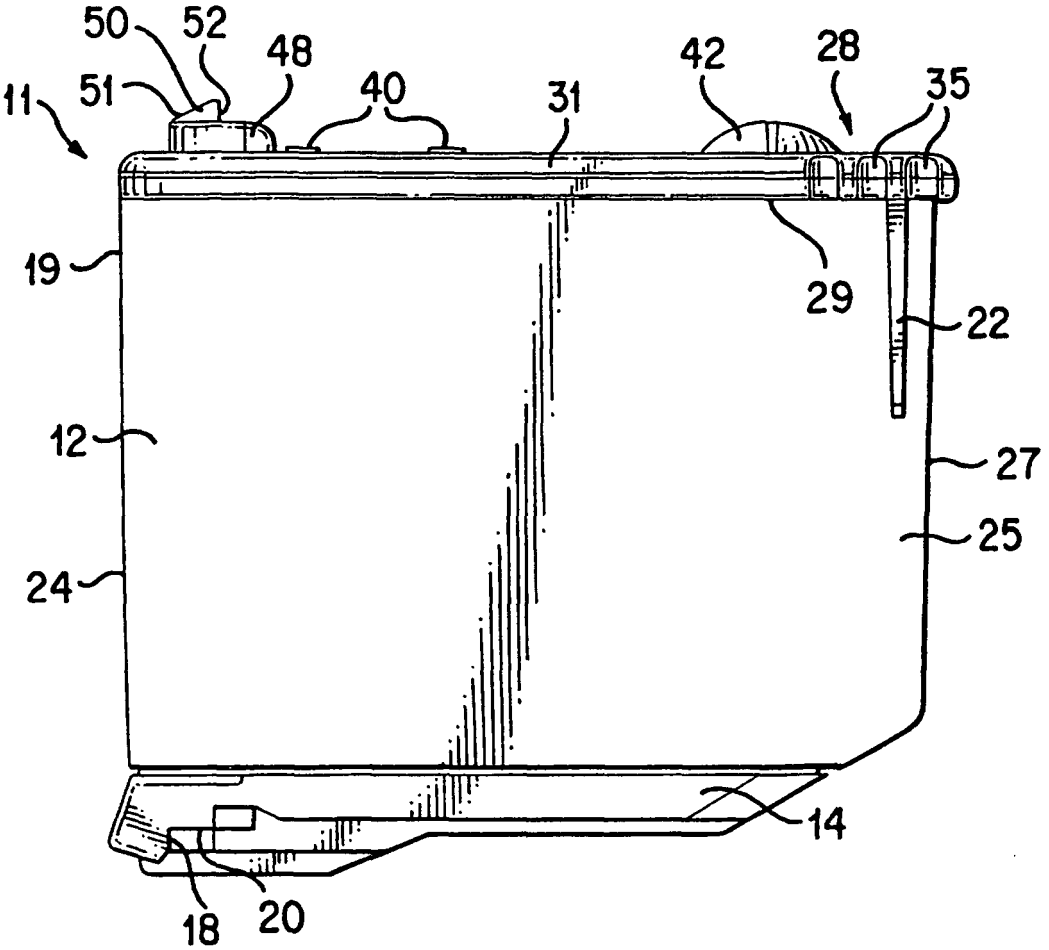

FIG. 5

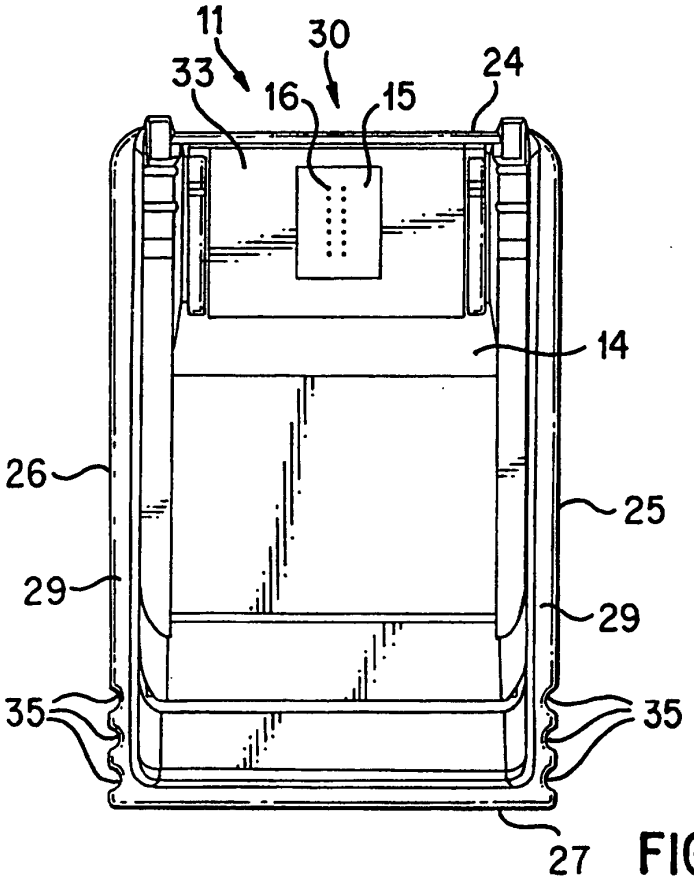
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FIG. 6

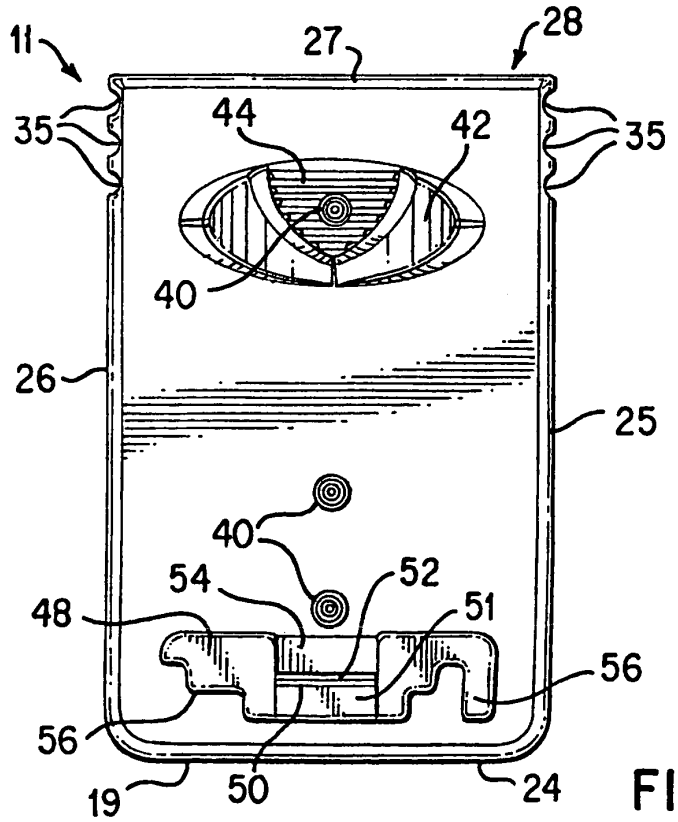
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FIG. 7